Summary of Flagstaff area NPS units GRI meeting June 28-29th, 2001

Summary
A geologic resources inventory workshop was held for the three Flagstaff area NPS units (Walnut Canyon NM, Wupatki NM, Sunset Crater NM) on June 28th and 29th, 2001, to view and discuss the park's geologic resources, to address the status of geologic mapping for compiling both paper and digital maps, and to assess resource management issues and needs. Cooperators from the NPS Geologic Resources Division (GRD), NPS Flagstaff area office, Colorado State University, and United States Geologic Survey (GS) were present for the workshop. This was part of a multi-park scoping session also involving Petrified Forest NP, Pipe Spring NM, and Navajo NM.

On Friday June 29th, scoping involved a half-day field trip to view the geology of Sunset Crater NM and Wupatki NM, led by Sarah Hanson (Adrian College) and Helen Fairley (NPS). On June 28th scoping included another half-day session to present overviews of the NPS Inventory and Monitoring (I&M) program, the Geologic Resources Division, and the on-going Geologic Resources Inventory (GRI). Round table discussions involving geologic issues for Flagstaff area parks included interpretation, natural resources, the status of geologic mapping efforts, sources of available data, geologic hazards, and action items generated from this meeting.

Currently, the major geologic issues facing the Flagstaff area parks are as follows:

- acquiring digital geologic maps at a large scale suitable for resource management needs;
- production of an interpretive product that could be sold in visitor centers showcasing the geologic map of each area and its significance to the other resources;
- evaluating potential volcanic hazards in the Flagstaff area and how they might affect park resources, and
- an inventory of the paleontological resources at each park

For a list of meeting attendees, see **Appendix A *(List of Attendees for Geological Resources Inventory Workshop, June 25-29, 2001)***

Geologic Mapping

All three Flagstaff area parks are included on the USGS publication "***Map Showing Geology, Structure, and Uranium Deposits of the Flagstaff 1 x 2 degree quadrangle, Arizona***; USGS Map I-1446; scale *1:250,000*). While this small scale is not necessarily conducive for resource management, it is an excellent compilation map and was developed based upon larger scale mapping. However, larger scale mapping (at least *1:24,000* scale) is desirable for each of the three parks.

Also, the USGS published the "***Geologic Map of the Eastern San Francisco volcanic field, Arizona***; USGS Map I-953" that is at a scale of *1:50,000* that also covers the areas of the three parks, but does not necessarily include geologic mapping of each park. Specifically, the only park that is fully covered on this sheet is Sunset Crater NM. Walnut Canyon NM is completely uncovered and Wupatki NM is only partially covered.

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Park staff were interested in seeing a map showing travertine deposits because it has numerous implications for the cultural significance in population distributions and the history of water in the area, so it should be a component of any new mapping.

Additionally, volcanic- and other features should be included (vents, flows, lava tubes, ice caves, etc.) as they are important in deducing a potential for volcanic hazards in the area as well as providing baseline data for what types of features exist in the park.

Digital Geologic Map coverage

It is not known if any of the USGS maps (I-953 and I-1446) for the area have been converted to a digital format. If they have not it is suggested that they be scanned, registered and rectified for preliminary use in a GIS until new mapping is accomplished as they are the best available source of baseline geologic data for each park.

Other desired GIS data

Nicole Tancreto had served as the Flagstaff GIS support person, but is now in a GIS position for the Southern Colorado Plateau network. She mentioned at the meeting that the boundary for Walnut Canyon NM was incorrect on our maps, so she supplied GRI staff with the correct boundary as ESRI shape files.

Aerial photography is desired for the entire area and would assist in any future needed geologic mapping. It was suggested to contact the Vegetation Mapping program and the USFS to see if they have such data for the area.

Miscellaneous Items of interest

Current natural resource staff at Flagstaff area parks are Helen Fairley (archeologist), Paul Whitefield, and Todd Metzger.

Geothermal development is a hot topic for the Flagstaff area, and could have effects on each parks management plan.

Sunset Crater NM

- Dick Holm (NAU retired professor) has done research at SUCR on the lava flows. However, much of this work is not digital at the present time. His 1987 GSA article "***Holocene scoria cone and lava flows at Sunset Crater, northern Arizona***", has a map showing the vent deposits and lava flows and would be a good map to get into digital format. For the most part, it is the same map portrayed on I-953.

- Sarah Hanson (SUCR-GIP, Adrian College) has been assisting the park with their geological interpretation program for the past few summers, and has added important knowledge of the geochemistry of the park. She has been successful in translating her research into layman's terms for the park staff.

- Steep cinder cones are very susceptible to erosion. Over the years, park visitors have used these resources for recreational activities and it has resulted in some degradation of the resources. It was suggested that a spatter cone inventory be

initiated to attempt to discern what condition the cones are in and which ones should be closed to visitor use in an attempt to better stabilize them and protect them.

Wupatki NM

- An Arizona State University student (Amos) published on "***Pyroclastic activity of Sunset Crater; evidence for a large magnitude, high dispersal strombolian eruption***" in 1981. According to Michael Ort (NAU-Geology Department), this produced a map that is now digital and can be supplied to the NPS from him. It also has isopach lines that the parks are interested in obtaining digitally.

- Daniel McCormack (NAU) published "***The geology of Wupatki National Monument, northern Arizona***" as his masters thesis; a copy of this is desired by GRI staff and could serve as the geologic map for WUPA as it was apparently done at *1:24,000* scale and encompasses the Doanie Cliffs area.

- Cynthia Blythe (NAU, 1995) did a Masters thesis on gravels east of the Doanie Cliffs.

- A paper on the structural geology of the region is "***Geomorphology and structure of the East Kaibab monocline,"*** Arizona and Utah: Geological Society of America Bulletin, No. 2; Scale: 1:160,000.

- Dick Holm (NAU-retired) mapped along Deadman Wash for the cinder cones, however its not known if this was published or not.

- Gorden Haxel (USGS) may have worked on an interpretive guide for Wupatki with the Arizona GS; we need to contact the AZ GS for specifics.

- Karst features including Earth cracks, lava tubes and ice caves are a unique geologic feature in the Wupatki area and are of concern because of risks to visitor safety. It has been suggested that a cave inventory be completed for the area, as it is known that WUPA contains one of the largest caves in northern Arizona. Nicole Tancreto mentioned that many of these features have had GPS locations taken for them, so they exist in a digital layer.

- Many of the blowholes at WUPA have been negatively affected over the years because of serving as dumping grounds and now some need restoration work. Additionally, they may also be potential hazards because of their depth.

- There are also several borrow pits (~12) that need restoration; Dave Steensen (NPS-GRD, Disturbed Lands Program) has made numerous recommendations on how best to reclaim these areas.

- The Water Resources Division (USGS or NPS ??) has been studying recharge in the area as it is critical to sustaining wildlife populations. Contact is Christiansen; unsure of first name though. Additionally, it was noted that the existing water well at

WUPA is approximately 1500-1700 feet deep and the water quantity and quality leaves much to be desired.

- Helen Fairley (archeologist) is interested in determining the provenance of the various clays and stones used in mortars over the years and how it relates to the cultural and geologic resources of the area. It was suggested that this would make a good MS topic.

- Both WUPA and SUCR have gravel deposits that are considered by many to have commercial value and external pressure may be exerted to exploit these resources and could cause resource management problems in the future.

- There may be uranium and petroleum potential on WUPA lands. Mineral rights were not acquired for the area when the land became federal. Any mineral rights apparently belong to the Arizona land office.

Walnut Canyon NM

- General geology of WACA consists of the Kaibab, Toroweap, Coconino, Moenkopi formations, as well as some igneous cinders.

- I-953 does not cover the geology of WACA, and thus a large-scale geologic map is definitely needed.

- Paleontological resources do exist in exposures along WACA trails and have been subjected to pilferage over the years. A paleontological survey is advised for the park.

- Detailed studies of the alluvial deposits in the canyons are desired. Richard Hereford (USGS) is the most likely qualified candidate to do this and should be consulted for his interest

- George Billingsley mentioned that there is a dam in the park that should be restored and incorporated into the parks interpretive story.

Appendix A: List of Attendees for Geological Resources Inventory Workshop
June 25-29, 2001

NAME	*AFFILIATION*	*PHONE*	*E-MAIL*	Navajo 6-25	Grand Canyon 6-26	Petrified Forest 6-27	Flagstaff 6-28	Wupatki-Sunset Crater 6-29
John Graham	Colorado State University	970-225-6333	Jpgraham250@msn.com	X	X	X	X	X
Tim Connors	NPS, GRD	303-969-2093	Tim_connors@nps.gov	X	X	X	X	X
Sherrie Landon	NAVA	307-755-1336	Slandon@uwyo.edu	X	X			
Brenton White	NPS, NAVA	520-672-2720	Brenton_White@nps.gov	X				
Kevin Harper	NPS, NAVA Archeologist	520-672-2720	Kevin_harper@nps.gov	X				
James Charles	NPS, NAVA Superintendent	928-672-2700	James_charles@nps.gov	X			X	
George Billingsley	USGS	928-556-7198	Gbillingsley@usgs.gov		X	X	X	
Della Snyder	NPS, GRCA	928-226-0163	Della_snyder@nps.gov		X			
Allyson Mathis	NPS, GRCA Interpretation	520-638-7955	Allyson_mathis@nps.gov		X			
Debra Block	USGS	928-556-7138	Dblock@usgs.gov		X			
Jessica Wellmeyer	USGS	928-556-7267	Jwellmeyer@hotmail.com		X			
John Rihs	NPS, GRCA Hydrologist	520-638-7905	John_rihs@nps.gov		X			
Scott Graham	USGS	928-556-7270	Sgraham@usgs.gov		X		X	
Tracey Felger	NPS, GRCA GIS	520-556-7164	Tracey_felger@nps.gov		X		X	
Bill Parker	PEFO Paleontologist		William_parker@nps.gov			X	X	
Karen Beppler	NPS, PEFO	928-624-6228, ext. 263	Karen_beppler@nps.gov			X	X	
Sid Ash	PEFO	505-856-5852	Sidash@aol.com			X	X	
Sue Clements	NPS, PEFO		Tecumseh@selway.umt.edu			X	X	
Sarah Hanson	SUCR GIP	520-526-0502 517-264-3944	Slhanson@adrian.edu				X	X
Dave Sharrow	NPS, PISP	435-644-4318	Dave_sharrow@nps.gov				X	
Helen Fairley	NPS, Flagstaff Area	928-526-1157	Helen_fairley@nps.gov				X	X
Michael Ort	Northern Arizona University	928-523-9363	Michael.ort@nau.edu				X	
Nicole Tancreto	NPS, Flagstaff	928-556-7466, ext. 240	Nicole_tancreto@nps.gov				X	
Paul Whitefield	NPS, Flagstaff area parks	928-526-1157	Paul_whitefield@nps.gov				X	X
Ron Hiebert	NPS, NAU-CESU	520-523-0877	Ron.hiebert@nau.edu				X	
Todd Metzger	NPS, Flagstaff		Todd_metzger@nps.gov				X	